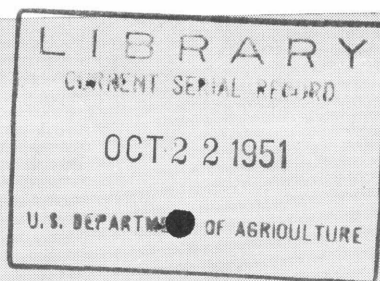


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Sericea



in
conservation
farming

FARMERS' BULLETIN No. 2033, U. S. DEPARTMENT OF AGRICULTURE

SOUTHERN AGRICULTURE owes much to the memory of Dr. A. J. Pieters and other pioneers in the field of plant introduction for bringing sericea into this country and developing its use as a crop. It also owes a debt to those pioneer farmers who had enough vision and patience to carry sericea through its earlier trials. Sericea is contributing to a new and better Southern agriculture.

Bare slopes that have inspired poetic reference to the red hills of Georgia and other Southern States are putting on a coat of green. Erosion losses are being reduced, tired lands are being revitalized, and cash-crop farming is trending toward a better balance between crops and livestock.

Sericea is a hardy, deep-rooted, perennial summer legume that grows on sites which are not best for many of the other legumes and grasses. Its roots penetrate deeply enough to reach moisture during periods of summer drought and take mineral nutrients that are beyond the reach of shallow-rooted plants.

In addition to its soil-holding and soil-improving abilities, sericea is a good forage crop, valuable for both hay and pasture. Its herbage feeds livestock and thus gives farmers a market outlet for other legumes and grasses that are needed in protective and conservation-type rotations on cultivated land.

Sericea

in conservation farming

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Sericea in Southern Agriculture

SUCCESS in carrying out farm conservation requires the use of many plants. Plants, like land, have varying capabilities. Sericea has a special place in Southern agriculture because it can make a good cover on land too poor for lots of plants. Its deep roots (fig. 1) permit it to thrive on sloping eroded land where other plants won't grow.

But it does more than just protect the soil from erosion. Since it is a legume it helps build up the soil. And more and more farmers are finding that it makes very good hay and pasture.

The fact that sericea grows on poor soil has, in a way, retarded its use as a forage crop. Sometimes too much emphasis has been placed on its growth on poor land; too little on its possibilities on better land. Moreover, the fact that sericea survives a year or two of close grazing also led to some wrong ideas about its hardness. Again, there was a tendency to penalize the plant by practicing the hardest possible usage.

Much has been done to correct these wrong ideas. Field workers in State and other agricultural experiment stations and in other agricultural agencies have studied sericea. Farmers, too, have contributed much to what is now known about sericea. They have planted it on practically every kind of soil, fertilized and limed it with different kinds of materials, mowed it for hay, and pastured livestock on it.

The scientific name for sericea is *Lespedeza cuneata*. It was first known as *Lespedeza sericea*, hence its common name, "sericea." It is an upright, perennial summer legume. Each fall it is killed back to the ground by frost. It comes back from new shoots at the crown early the next spring.

Plants in broadcast seedings usually do not grow more than a few inches high the first summer. But if sown moderately early in the spring, in most places they make strong growth the second year. Where it is not mowed for hay or grazed, sericea on good land often grows to a height of 5 feet.

New shoots of sericea are tender and succulent until plants are about 12 inches high. After that they become woody and fibrous. For this reason, hay is usually cut when plants are about 12 inches high. The degree of succulence, however, cannot be judged entirely by height. Plants on rich soils grow faster and retain their tenderness to a greater height than those on poor soils.

Sericea for Ground Cover

From the soil-conserving and soil-improving standpoint, the mulching habit of sericea is one of its strongest points. Lower leaves that drop during the growing season and the leaves that drop after frost form an excellent mulch. Depending on how sericea is harvested, as much as 2 tons of leaf residue an acre may accumulate in 1 year. The maximum amount that has been measured is 14 tons of leaf litter per acre after 9 years' growth in a seed-producing stand.

Under this mat of leaf litter there is little chance of erosion. This mulch, the dense stand of stemmy plants, and the deep branching root system protect the soil against both raindrops and running water. After sericea



Figure 1.—*The stubble and roots of one sericea plant. The longest roots penetrated 4 feet into the soil.*

has grown several years, the leaf mold and the roots improve the soil structure and build up the productivity.

Protection of Sloping Land

Ground cover to protect the surface against beating raindrops and to reduce the cutting effect of running water is of first importance in the protection of sloping land. Sericea is one of the better covers for sloping land—because of its deep branching root system, its thick stand of stemmy plants, and the leaf mulch it lays down.

If sloping land in capability Class III is cultivated, it requires a complete water-disposal system. This includes terraces, vegetated outlets at terrace ends, and contour tillage. Even so, it needs an effective cover about 2 years out of 3 or it erodes rapidly. Sericea for hay or grazing can be used to good advantage on Class III land where there is enough better land for the necessary cultivated crops. Class III land that is covered by a thick stand of sericea needs less protection by terraces and other expensive mechanical measures than cultivated Class III land.

Class IV land in the South is steep enough to erode severely if exposed to rainfall and runoff. In fact, most of it is already eroded to such an extent



Figure 2.—A 12-acre field of sericea on Class IV land that is not well suited to cultivated crops is furnishing pasture for 115 sheep.

that it no longer makes safe or profitable cropland. This is particularly true under rotations that include only shallow-rooted plants. Class IV land is best suited for a use that keeps it under protective cover. Sericea fits well on such land (fig. 2). When a thick stand is established, it gives almost complete protection against further destructive erosion.

Class VI land in the South is too steep or eroded to be cultivated safely at any time. It needs a good cover of vegetation at all times. Sericea in a thick stand, or sericea in a mixture with grass, furnishes this cover. If the stand of sericea is thin or is overgrazed, however, it will not give adequate protection against erosion.

Sericea is also well suited to two special slope conditions in the South. The fairly regular strips along the contour where slopes change abruptly present serious erosion problems in cultivated fields (fig. 3). These "critical" slopes range from one to several terrace intervals in width. Terrace construction and maintenance are more difficult and expensive on these slopes than on the rest of the field. The land on these slopes is Class IV or VI land. Rotations based on the needs of the Class II and III land in the rest of the fields are not enough protection for them.

Sericea does a good job of protecting these "critical" slopes. It should extend over the entire steep portion. A terrace or a diversion ditch should be located just below the sericea strip. Unless some kind of diversion channel is provided, the clear water flowing out of the sericea (where it has dropped most of its load of soil) picks up a new load and causes severe erosion on plowed land immediately below the sericea. Grass grown with sericea increases the protectiveness of the cover.

In the Coastal Plain, there is a different slope condition that often complicates water disposal. Long, smooth slopes often break toward the bottom into an extremely irregular surface. Terraces and contour tillage are practicable on the upper part but not on the broken, irregular part. Much



Figure 3.—*Sericea* protects this "critical" slope through a cultivated field from destructive erosion and also produces hay.

trouble and expense is avoided where these lower slopes are planted to perennial vegetation that may be used for either hay or pasture. *Sericea* is a good cover for these steep, irregular areas.

Sericea in Rotations

Sericea is an excellent legume for use in rotations. Besides giving protection against erosion, its deep root penetration increases the soil's capacity for absorbing water. Also, *sericea* manures the land so that it will produce larger yields.

Observations on farms indicate that the depth of topsoil largely determines the success of *sericea* rotations. Where all topsoil had been washed off, the crops that followed *sericea* were much poorer than where a few inches of topsoil remained. Also, the crops planted after *sericea* often needed nitrogen fertilizer. The dry, woody stems seem to rot too slowly to release nitrogen in time for the use of the next crop.

Sericea fits well in rotations on Class III land. Two or more years of *sericea* for hay or grazing are followed by 1 year of corn or cotton and then a crop of small grain. Such rotations are more effective when arranged in contour strips.

Where Class IV land on "critical" slopes must be cultivated to meet the needs of the farm for certain crops, the following *sericea*-based rotation can be used to good advantage. As a rule, however, not more than half the land on a critical slope should be plowed at one time.

Sericea on the critical slopes is plowed and the land is planted to a cultivated crop. Small grain is planted in the fall after the cultivated crop has been harvested. *Sericea* is then sown again after grain has been harvested the following spring.



Figure 4.—*This is the second crop of corn following 3 years of sericea on this deep, sandy soil. The yield of corn was about 70 bushels per acre where yields on unimproved land averaged less than 20 bushels.*

Where the critical slope includes several terrace intervals, the rotation may be laid out completely on the one slope. Where the critical slopes are narrow enough to include only one or two terrace intervals, rotations may be carried on between the critical slopes. This will allow a fair balance in crop acreage to be maintained from year to year.

The value of sericea in cropping systems has been determined through research, and research results have been substantiated by the experience of farmers (fig. 4).

An outstanding example was at the West Tennessee Agricultural Experiment Station at Jackson. In 1930 sericea was planted on land that usually produced about 25 bushels of corn per acre. For 3 years it was either cut for hay or harvested for seed. In 1933 two $\frac{1}{40}$ -acre plots were plowed and planted to corn. Each year through 1943 two additional plots were plowed, and these along with the old plots were planted to corn. Under this treatment, the immediate and the residual effects of sericea on corn yields were studied. The average yield of corn for the 11 first-year crops after sericea was 70 bushels, and 66 bushels for the 10 second-year crops.

Rice Westbrook, Ila, Ga., planted several contour strips to sericea in a field that usually made about 15 bushels of corn per acre. He harvested sericea hay each of the next 10 years. At the same time, land between the sericea strips was improved by the use of better cropping systems that included annual legumes. The entire field was plowed and planted to corn

in 1949. The sericea strips made about 70 bushels per acre as compared with 30 bushels on the remainder of the field.

The value of sericea in building up the productivity of land was also shown in a striking way on the farm of T. L. Smith, Greer, S. C., in 1941. Land where sericea had grown produced 96 bushels of barley per acre. The barley was fertilized in the fall with 300 pounds of 4-8-6 commercial fertilizer per acre and topped the following spring with 125 pounds of nitrate of soda per acre.

Sericea in Waterways

Water from terraces and crop rows must be conducted off the fields under proper control if erosion damage is to be avoided. Sericea is effective in protecting natural depressions where this water is emptied (fig. 5). It is most effective where slopes are not more than 5 percent. And it is suitable only for sites that are at least moderately well drained.

Sericea stands in waterways need to be well established before large volumes of water are turned on. Farmers usually plant the sericea the spring before the terraces are to be constructed. The stand should be thick. Seeding at a higher rate than is used in general field plantings is a good practice. Thick stands are of particular importance where the slope of the waterway is more than 5 percent.

Sericea and tall fescue offer good possibilities for waterway protection. Both have strong root systems, and fescue adds density to the stand. Recent plantings show that the two may be grown together for at least a few years. Further experience is needed to determine how they will live together in a long-time stand. It remains to be seen whether either plant will crowd the other out of the mixture (see pp. 17-19).



Figure 5.—Four-year-old sericea in this meadow outlet is cut for hay each summer and is grazed by livestock.



Figure 6.—*Bicolor* next to the woods and *sericea* next to the field make a good protective border. The *sericea* makes a good turn strip and furnishes cover for quails and songbirds. *Bicolor* next to the woods produces seed that is one of the best foods for birds.

Sericea in Field Borders

Between every cultivated field and any woods that adjoins it there is a strip where the field crop doesn't grow. Shade and the sapping effect of the tree roots prevent normal growth of crops like cotton and corn. Erosion is severe along these field borders if they are sloping.

Sericea is a good ground cover for these borders because it makes better growth in competition with the trees than crops that have shallower root systems.

A common conservation practice is to plant lespedeza *bicolor* or one of the other shrub lespedezas in a 15-foot strip next to the trees and *sericea* on the rest of the area made unproductive by tree competition (fig. 6). Field borders of this type have many advantages. They reduce erosion and serve as convenient turn strips for farm implements. They save the labor and seed that would be wasted if they were planted to cultivated crops. Also, they make good wildlife areas. *Sericea* furnishes cover for quail and song birds; *bicolor* lespedeza seed is one of the best foods for quail.

Sericea also is useful for planting at row ends along roadways. Where these row ends empty over steep banks, erosion often is noticeable for several feet back from the bank. After the topsoil is washed off, yields are low. The crop plants broken down by turning cultivating equipment at the ends of rows further reduce yields. *Sericea* on these borders both reduces erosion and furnishes convenient turn strips at the ends of rows.

Sericea in Gullies

Sericea is an excellent type of vegetation for the control of certain kinds of gullies. It is best adapted to shallow gullies with a natural slope to their banks. *Sericea* seeded in these shallow gullies has stopped erosion and caught soil material that otherwise would have been washed away in runoff water. In fact, many shallow gullies have been filled by such captured soil. Where the sides of the gullies are sterile, seeding on prepared seedbeds, fertilizing, and light mulching with straw or pine tops is helpful in getting good stands of *sericea*.

In deeper gullies, mechanical sloping of the banks should be the first step. After the banks are sloped enough for *sericea* to grow on them, fertilizing and light mulching help in getting a ground cover established (fig. 7). Mulching materials can easily be applied too thickly, however, resulting in poor stands of *sericea*. After mulch is spread, about 50 percent of the ground surface should show through the mulch. Old *sericea* plants with mature seed are effective for both mulching and seeding. They should be spread thinly, but evenly, over the gully banks.

Besides controlling erosion, *sericea* in a deep gully can turn it into a good wildlife area. As in field borders, *sericea* in a gully provides cover for songbirds and quail. In this way, waste land is turned into useful wildlife land.



Figure 7.—A dense stand of *sericea* has completely stopped erosion in this gully. Gully banks were sloped, fertilized, seeded, and mulched lightly to get the *sericea* started.



Figure 8.—A thick stand of sericea gives good cover on this road bank.

Sericea on Road Banks

Sericea makes a good ground cover for road banks that are sloped enough to permit mowing (fig. 8). Unless the banks can be mowed, it is very difficult to get a good, thick stand of sericea established. Where the stand is thin, further erosion may occur under the sericea plants. After the banks have been sloped, liberal fertilizing, heavy seeding, and light mulching help in establishing good stands.

Sericea for Hay

Sericea makes good hay. But to be of the best quality it must be mowed at the proper time and cured properly. Sericea is different from most legumes in that it must be harvested in a much earlier stage of growth. Mowed in the bloom stage it makes a coarse, woody hay that loses most of its leaves. Mowed when plants are 10 to 12 inches high and cured properly, however, sericea makes high-quality hay that is eaten readily by livestock.

Along with the added stemminess and coarseness, two other factors go a long way toward explaining why sericea must be cut early for the best hay. (1) The protein content of the hay decreases as the plants advance in growth. (2) The tannin content of the leaves increases rapidly as the plants grow taller. There is an increase in the tannin content of the stems also, but this is much less pronounced than in the leaves. The increase in tannin makes the hay less palatable to livestock.

The height of plants is not an absolute measure of hay quality. Fifteen-inch sericea grown under favorable conditions may be more succulent and make better hay than 12-inch sericea that has made slow growth. This fact emphasizes the need for fertilizer treatment to stimulate rapid growth. (See p. 25.) When plants are vigorous enough to reach a height of 10 to 12 inches within a few weeks, sericea makes its best quality hay.

Sericea hay cures very rapidly. In good hay-making weather, hay may be cut in the morning, raked into loose windrows within an hour or two after mowing, and stored as loose hay late in the afternoon. Usually, the hay is dry enough to bale from the windrow the day after it is mowed. This rapid curing gives sericea an advantage over the slower curing kinds of hay in the Southeast where the weather is a hazard in haymaking.

It is not yet known how good-quality sericea hay will compare with alfalfa and other legume hays in feeding value. Most of the feeding trials have been made with sericea that was mowed after it was too old for the best quality of hay. These trials show sericea to be about 80 percent as valuable as alfalfa hay. But the alfalfa was better known to farmers than sericea and was cut more nearly at the right stage of growth.

Further feeding trials are needed in which sericea grown on well-fertilized land is cut at the right stage and cured properly. Then sericea can be compared accurately with other kinds of legume hay. Farmers who have made and fed good-quality sericea hay, however, are satisfied that its feeding value is satisfactory.

Sericea makes large yields of hay when given good treatment. C. P. Barnett & Son, Greer, S. C., harvested 7 tons of sericea hay per acre in a



Figure 9.—*Baling lespedeza hay cut from a contour-ridged pasture.*

hay-production contest sponsored by the Greenville County Bankers Assn. They had sericea on good land and fertilized it liberally. Of course, for the contest, they mowed as often as the plants were high enough, and they probably weakened the stand. The total yield, however, illustrates the high-yielding ability of sericea when it is planted on good land and well fertilized.

Mowing Management

After cutting, sericea does not sprout out from crown buds, but from the stubble. This makes it necessary to mow at a height of 2 to 3 inches above the ground. Many stands have been severely damaged because sericea was mowed close like annual lespedeza.

Frequently, farmers mow sericea too late in the fall to allow the roots to store enough food before frost. As a consequence, stands are thin and plants are weak. This permits the encroachment of broomsedge and other kinds of weeds. Stronger stands were maintained where the last cutting was made by August 15 in the upper part of the South and by about September 1 in the lower South.

Sericea may be mowed for hay twice a year on moderately productive land and three times on rich land. On poor soils, one cutting of hay is about all that can be expected. Farmers who follow a regular schedule of fertilizing sericea with both phosphate and potash get two cuttings on most soils and three on the better ones. More cuttings can be made in good seasons than in extremely dry summers.

Sericea for Pastures

Sericea was not widely used for pasture until recently. Most farmers thought green sericea was unpalatable to livestock. Now, however, the acreage of sericea for pasture is being expanded faster than that of any other perennial legume.

Sericea is one of the best upland pasture plants for the humid parts of the South (figs. 10 and 11). Farmers are learning that sericea sends its roots down deep enough to get moisture and stay green during summer droughts when other upland and many lowland pastures fail.

Like other crops, sericea has certain management requirements that must be taken into account. Animals graze sericea most readily if allowed to begin grazing before the plants are too far advanced. In other words, when the plants are 3 to 4 inches high. Sometimes it is necessary to turn cattle into a field after plants are large enough to make hay. If this sericea is mowed and raked into windrows, cattle will eat the hay and then begin grazing the new, tender shoots as they come out.

When sericea is planted in a pasture, the question may arise as to whether the new seeding should be fenced out the first year. Fencing is, of course, the safest protection for a new seeding. But where there is plenty of other feed in the pasture for the animals, they do not injure the stand of sericea.

Some farmers have thought it necessary to fence a field of sericea separately. They thought they had to force cattle to eat sericea. But cattle



Figure 10.—*Dairy cows grazing a 4-year-old stand of sericea on Hartselle fine sandy loam.*

graze sericea where it is in the same pastures with grass and clover. Farmers report that cattle usually graze grass and clover in the morning and sericea in the afternoon.

On several Land Utilization projects of the Soil Conservation Service, grass and clover were sown on lowland and sericea on upland in the same field. Local farmers leased the grazing rights and turned cattle into these pastures. Cattle did a satisfactory job of balancing their use of the upland sericea and the lowland grass and clover pastures. In a few fields where the acreage of sericea was only about one-fifth as large as the acreage of the grass and clover pasture, the sericea was overgrazed.

The Alabama Agricultural Experiment Station included sericea as one kind of pasture in a year-round grazing program on the station farm at Auburn from 1943 to 1946. One acre of sericea, one acre of kudzu, and a half acre of Manganese bur-clover followed by a summer crop of grain sorghum, was provided for each beef cow and her calf.

Cattle grazed sericea and kudzu an average of 217 days, April 13 to November 16, during the 3 years of the experiment. Most of the grazing was from sericea. The cattle were turned on the sericea when new shoots were 3 to 4 inches high. They kept it grazed close enough all season to prevent the plants from becoming coarse, woody, or bitter.

During the first year sericea was the sole pasture from April 12 to October 20; the combined gain of cows and calves was 330 pounds per acre. In the other 2 years, kudzu was pastured during summer droughts to lighten the load on the sericea. The 3-year average gain of a cow and her calf during the 217-day grazing period was 393 pounds per acre. Since the kudzu was grazed only for short periods the last 2 years of the experiment, most of this can be credited to sericea.

At the Upper Coastal Plain Substation, Winfield, Ala., sericea that was fertilized annually with 500 pounds of 0-14-10 fertilizer per acre produced \$15.85 worth of milk per acre per month. This is a gross value of about \$100 per acre during a 6-month period.

At the Sandhill Experiment Station in South Carolina, dairy heifers were pastured on sericea from April 9 to September 30, 1946. The station reported that the plants were about 9 inches high when the heifers were turned on the sericea and that they ate it readily during the 174-day grazing period. The heifers made an average daily gain of 1.19 pounds. The total gain per acre was 357 pounds.

If a field is not stocked heavily enough, livestock tend to graze in spots and allow plants in other parts of the field to grow. To get more uniform grazing the tall plants may be mowed. Early in the fall, however, cattle begin grazing the larger plants and often graze them to the ground.

This tendency to leave these old plants until fall and then graze them again probably is due to the lower tannin content in the fall. R. E. Stitt and G. D. Clarke, working at the North Carolina Agricultural Experiment Station, found that the tannin content in the leaves of unmowed sericea increased until about July and decreased after that. Their findings correspond rather closely with the seasonal grazing habits of animals.

Sericea can be overgrazed. Several small areas of sericea fenced into pastures have been grazed out completely during the first few years after they were fenced. It is better to stock at a rate that may require occasional mowing than to put on enough animals to keep the plants grazed close during the entire season (fig. 12).



Figure 11.—Beef cattle grazing a 5-year-old stand of sericea on Fullerton cherty loam.



Figure 12.—*This 2-acre 3-year-old stand of sericea pastured 18 hogs, 1 goat, and 7 cows during the summer. It was mowed three times.*

Sericea in Mixtures

Sericea usually has been seeded alone rather than in mixtures with other legumes or with grass. This limits the use of the land to the part of the year when sericea is green. Several combinations with winter-growing plants are under observation, and preliminary results are favorable. Some mixtures are giving both winter and spring grazing in addition to the summer grazing from sericea.

All reseeding winter legumes being planted on sericea fields are more exacting in their lime and fertilizer requirements than is sericea. Liming and fertilizing to meet the needs of the winter legume is essential to success with these combinations.

Reseeding crimson clover is used more extensively with sericea than any other winter-growing plant. Because of its upright habit of growth, it is well suited to this use. Grazed until about time for it to begin blooming, crimson clover does not grow tall enough to bed down and smother the sericea early in the spring. Crimson clover develops best stands when sown moderately late in the fall on sericea that is grazed or mowed fairly close before the clover is sown.

Later volunteer stands of clover are uncertain unless the tops of sericea are mowed or grazed off in late summer so as to expose the ground surface to light. A few fields have been seen, however, where crimson clover came back to thick stands after the sericea matured and was harvested for seed. As a rule, however, reseeding crimson clover fits better with sericea that is used for pasture than for either hay or seed production.



Figure 13.—*Wild winter peas were sown on a stand of sericea in the fall of 1948. Above, the peas, April 26, 1949; below, the thick stand of sericea that came back following the wild winter peas shown above.*



Wild winter peas (also called Caley or Singletary peas) are another reseedling legume that grows well with sericea (fig. 13). This mixture must either be grazed close in the spring or be mowed for hay about the time the pea plants begin to bloom. Otherwise, the rank growth of the wild winter pea beds down in a heavy mat that smothers and weakens the stand of sericea.

When it is necessary to mow a crop of pea hay, plants should be mowed about as high as the cutter bar can be set. This will leave enough plants to make seed for a stand the next fall. Livestock must be removed while peas are making seed to avoid any chance of toxic poisoning. This poisoning occurs only while animals are grazing peas in the seeding stage. Its principal symptom is stiffness in the hindquarters of the affected animals. It is seldom fatal.

Manganese bur-clover can also be sown on sericea for winter and spring pasture. It, however, has a spreading habit of growth that results in a heavy matting of the plants as they approach maturity. Because of this, close grazing to prevent smothering sericea plants in the early spring is very important.

Tall fescue-sericea mixtures are being tried but much remains to be learned about their management. Field experience during the 4 years such mixtures have been studied indicates that fescue sod will thicken if it survives the first summer (fig. 14). The grass may tend to crowd sericea out of the mixture after it is 2 or 3 years old. This crowding appears to be most likely where fescue is allowed to mature seed in the spring. Grazing to



Figure 14.—Tall fescue was sown on an old stand of sericea at Dalton, Ga., in the fall of 1947. Both the sericea and the fescue were pastured and both were harvested for seed in 1949, the year this photograph was made.

keep the fescue down so that sericea can get a start early in the spring appears to be one of the essentials in the management of this grass-legume mixture.

Usually, the fescue seed is drilled on sericea stubble after a good rain in the fall. Disk openers on the drill usually place the seed an inch or a little less in the ground. Seed may be sown after a rain and disked in lightly, if a drill is not available. Disking damages a sericea stand, particularly when dry soil is disked heavily.

A few good stands have been observed where 30 pounds of scarified sericea and 10 pounds of fescue seed were sown together early in the spring. With this method, clipping for weed control is necessary the first summer. Also, a spring seeding does not usually furnish any grazing before the fescue begins to grow in the fall. A top dressing of nitrogen fertilizer early in the fall stimulates the fescue so that it may be pastured in the winter and spring.

Fescue and sericea mixtures are better for grazing than they are for hay. It is possible, however, to pasture the fescue until early spring and then get a crop of seed, but its heavy growth tends to smother the sericea.

In a few fields, sericea on which fescue was seeded in the fall has been managed for sericea seed production the next year. But the heavy growth of sericea shaded the ground so completely that most of the fescue plants died during the first summer.

Fescue has also been seeded on sericea planted on "critical" slopes through cultivated fields. Here it is usually necessary to mow the sericea for hay in the summer and to pasture the fescue in winter.

Rescue grass is a short-lived perennial that has been sown on established stands of sericea. This grass makes good winter and early spring pasture and thickens its stand each fall by volunteering. Rescue grass may also be sown on sericea and reseeding crimson clover. Rescue grass may be less competitive than the fescue.

Italian ryegrass has also been used to good advantage along with reseeding crimson clover on sericea. Ryegrass volunteers after the first crop makes seed. This grass is a more dependable volunteering plant where the land is disked early in the fall. Disking weakens the stand of sericea, however, particularly where dry soil is disked heavily.

Sericea may be one of the best legumes to grow in mixtures with the narrow-leaf Bahia grasses. A small area of sandy soil at the Soil Conservation Service nursery at Americus, Ga., that was planted to sericea in 1937 was sown to Pensacola Bahia in 1945. It now appears that the two kinds of plants will make a good mixture for some of the deep, poor sands in the Coastal Plains.

Poor sandy soils may need to be conditioned with a crop of hairy indigo, crotalaria, or blue lupine before sericea and Bahia grass are sown. Results from a few observational plantings suggest that a good way to start this mixture is to disk down the dry residue of a summer legume or a crop of green lupine in February, then seed 30 pounds of scarified sericea and 10 pounds of Bahia grass seed per acre in late February or early March.

As with legumes, where grasses are planted with sericea, lime and fertilizer are essential. Further research and field experience are needed to determine what the rates of fertilizer should be. Probably they must be somewhat higher than would be required by either crop grown alone.

Small grain has been grown on established stands of sericea and used for winter pasture, spring hay, or grain. In many stands, the sericea was



Figure 15.—Reseeding crimson clover and tall fescue were sown on a stand of sericea in the fall of 1948. Above, the clover on April 25, 1949; below, the sericea on July 26, 1949, following the crimson clover shown above. The fescue is very thin, because of competition both from the crimson clover and from the sericea. The sericea was neither mowed nor grazed.



injured by disking in preparation for seeding the grain. Least damage resulted where the grain was drilled on the sericea stubble after a good rain so that the disk openers got the seed into the soil with minimum disturbance of the sericea plants.

But it must again be emphasized that further experience is necessary before anyone can say what the competitive effects of the different crops on the stands of sericea will be (fig. 15). Sericea seeded with perennial grasses and clovers in both North Carolina and Kentucky has survived several years. Its growth with these other plants gives cause for hope that it will grow in several different mixtures, if fertilized and managed properly. More experience will show what this management must be.

Sericea Seed Production

Because of the expanding acreage of sericea, the production of sericea seed has become an important enterprise. The total amount of seed harvested in the Southeast in 1949 was about 25 million pounds.

Seed yields are affected by climatic conditions, the production in dry falls being much lighter than in seasons of favorable moisture. There is no definite information about the best kind of soil for seed production. Seed yields are considerably better on well-fertilized than on unfertilized land.

Sericea produces larger total yields of seed when plants are allowed to grow the entire season than when mowed for hay. But even on moderately productive land, the sericea plants are often so large and coarse that harvesting is difficult. Therefore, it is common practice to harvest a cutting of hay as early as it is ready in the spring. The plants are then allowed to grow the rest of the season for seed production. This system produces plants of more uniform height and finer texture than if no hay is mowed. Plants of this kind pass through the combine better than coarse plants. The net result usually is that, besides the hay, more seed is harvested than would be from tall, coarse plants that grew the entire season.

Sometimes farmers harvest two crops of hay, and then expect a seed crop. Seed yields under such management are nearly always extremely low.

Several different methods of harvesting are used. These include (1) combining direct or (2) cutting and binding with a grain binder as soon as the seeds mature and threshing from the shock after the seed is fully dry. Sometimes sericea is cut with hand cradles, tied into bundles by hand, and threshed after seed is thoroughly dry.

The greater part of the seed crop is harvested by direct combining (fig. 16). It was once thought that seed could be combined only after frost had killed the plants. It is rather common practice now for farmers to harvest seed while leaves on the stems are still green. Seed shatters so much in some seasons that much of it is on the ground by the time frost occurs. This tendency to shatter appears to be variable; sometimes seed stays on the stems until frost, other times it begins shattering almost as soon as it is mature. Experienced seed growers examine their sericea frequently after the seed is mature and begin harvesting as soon as shattering begins.

Managers of Soil Conservation Service nurseries have harvested sericea seed under widely different conditions. They follow the instructions of the manufacturer in setting the combine for harvesting sericea seed and then make adjustments as needed. Most of them use 4 cylinder and 2 concave bars, with cylinder speeds of 900 to 1,400 r. p. m. They vary the



Figure 16.—*Sericea* seed is being harvested by direct combining on the farm of Dr. F. B. Rawlins, Sandersville, Ga.

clearance between cylinder and concave bars from a half inch to full width and open fan shutters a fourth to a half, depending on the condition of the sericea plants. More air is required when leaves are green than when plants are fully dry. But care must be used to avoid having seed blown over at the back of the combine. The combine operator must make adjustments of screens and sieves to get as much trash out of the seed as possible and at the same time to lose as few seeds as possible. It is better to leave trash in the seed and take it out with the cleaner than to let too much of the seed go out with the straw.

Seed must be completely dry before it is stored. In many localities, there are seed cleaners and driers where seed may be taken directly from the combine. Where no drier is available, seed must be spread as soon after harvesting as possible and stirred often enough to prevent heating until it is dry enough to be stored. Heating occurs where there is any green or moist seed, and heating materially reduces the viability of the seed.

Since yields of seed vary according to seasonal conditions and other factors, it is not possible to forecast far in advance how much seed will be made. Yields of 400 to 600 pounds of unhulled seed per acre are usually made, where seed is harvested early enough to avoid losses by shattering. About 25 to 30 percent by weight is usually lost in cleaning and hulling. This loss varies according to the amount of leaves or other material that is left in the seed by the thresher or the combine. It usually is safe to figure on getting about 70 pounds of clean seed from 100 pounds of unhulled seed.

Where Sericea Will Grow

Sericea is primarily a humid-area plant. Although it will grow under drought conditions, it is not well suited to areas where the rainfall is much less than 35 inches or where most of the rain falls in winter.

Sericea makes good growth as far south as northern Florida. Farther south in Florida it has not grown so well. The northern limit of sericea is not well known. As far north as the Ohio River it makes good growth. It can survive short subzero temperatures. The vigor of stands at Paducah, Ky., indicates that it might grow as far north as the southern parts of Indiana, Missouri, Illinois, and Pennsylvania. It grows as far west as rainfall conditions are favorable, that is, to eastern Texas and Oklahoma.

Sericea grows on somewhat wetter land than some of the other perennial legumes, but the land must be at least moderately well-drained. Sericea makes most vigorous growth on deep soils that absorb water readily.

Some of the best growth has been on the deep loess soils of Mississippi, Tennessee, and Kentucky, and the deep, red soils of the Piedmont Plateau. It also grows on several other kinds of land. Some of them it was once thought were not adapted to sericea. A few of them deserve special mention.

Sericea grows on many of the sandy soils. Usually, it grows best on sandy loams with clay loam subsoils within 18 to 24 inches of the surface. It does well, however, on some very deep sands that are well supplied with organic matter. Growth is more likely to be satisfactory if a crop of crotalaria or hairy indigo is grown and disked into the surface before sericea is seeded.

The heavy clay soils of the Black Belt were once considered unsuited for sericea, but several excellent stands are growing on these soils in both Alabama and Mississippi. Some of these are on alkaline limestone soils, others on heavy clays acid in reaction.

Sericea grows on hardpan soils only where the layer of soil over the hardpan is deep enough to allow its roots to develop in nearly normal fashion. Stands tend to thin out rapidly where the permeable layer is less than 18 to 20 inches deep. Weed competition also seems to be more severe on shallow hardpan soils.

Sericea is not very sensitive to soil acidity. It grows on soils ranging from strongly acid to alkaline in reaction. But it grows most vigorously on acid soils of from pH 5.5 to 6.5.

Sericea will stand several days of overflow, particularly in winter. It has been known to survive as much as 10 days of standing water at a time, particularly when the water is cold. Like most other plants, sericea does not survive very long under standing water in summer when the water is warm.

How To Grow Sericea

Sericea is an easy crop to grow if a few of the necessary things are done properly.

Sericea sown moderately early in the spring can be depended on almost everywhere in the South to make vigorous growth the next year. Where planting is done late in the spring or early in the summer, growth often

is so small the first year that the root system does not develop enough before winter to support normal, vigorous growth the second year. In such cases, a complete thick stand does not develop before the third year.

How To Seed Sericea

To get a stand of sericea a good seedbed is needed but deep plowing is not necessary. Only a few inches of the surface soil needs to be well pulverized. On sandy soils or other soils where a disk harrow will stir 2 or more inches of the surface, disking is sufficient. If there is a cover of vegetation, or if the ground is hard, breaking with a plow and harrowing are needed.

Where plowing is needed, it must be done far enough in advance of seeding for rain to settle the soil. Fall preparation is advisable where erosion is not likely to be a problem. Unless the land is prepared before spring, rains may cause sericea to be planted too late for best first-year growth.

Good stands usually result where the surface of a well-prepared, settled seedbed is freshened by light harrowing and cultipacked on the contour. Sow the seed behind the cultipacker and leave without covering—except on slopes where heavy rains might wash the seed down the slope. On these steeper slopes, press the seed into the soil by another cultipacking.

Seeding following a section harrow or a peanut weeder run on the contour so as to mark the surface soil lightly also gives good stands. On steep slopes, peanut weeders have been run over the surface a second time so as to give the seed very light covering to prevent drifting of the seed during rains.

Sericea does not come up to good stands if seed is covered deeply. About one-fourth to one-half inch is as much covering as it will stand.

How Much Seed

The trend in recent years has been toward heavy rates of seeding. Most successful sericea growers sow 30 to 40 pounds of hulled, scarified seed per acre. Some growers plant as much as 50 pounds per acre. Planted in the spring, these heavy rates usually produce enough extra hay the second year to more than offset the extra cost of seed.

Thick stands of sericea are important for several reasons. They make more complete and protective ground cover, make finer stemmed hay, and compete with weeds more successfully than do thin stands.

It is better to sow enough seed to get a thick stand in the beginning than to depend on a thin stand thickening from seed produced the second year and later. In most parts of the South, the old plants that come up the first year use the soil moisture so completely during spring and summer droughts that new seedlings do not survive the competition. In the upper South, however, climatic conditions are more favorable. Here new seedlings coming into old stands the second, third, and fourth years after seeding commonly develop into vigorous plants, thus thickening the original stand materially.

A few stands have been obtained by sowing unhulled, unscarified seed at rates of 60 to 75 pounds per acre in January or early February. Scarified seed, however, is much more dependable. And there is seldom any need for

farmers to sow unscarified seed. Almost every county of the Southeast has cleaning and scarifying equipment.

When To Seed

Early spring, a little earlier than the first "roasting ear" corn is planted, is the best time to seed sericea. In the lower South, seeding may be done safely in late February. Early March is the best date in the middle South and late March or early April in the upper South. Early planting is extremely important on sandy Coastal Plain soils. Plants on sandy soils usually fail to survive dry, hot periods in May and early June unless they have well-developed roots before then.

It is not necessary to wait until after all danger of frost is past to plant sericea. Young seedlings are cold-hardy, especially in the two-leaf stage. They withstand freezes that are severe enough to kill tender shoots on old sericea plants. Usually the plants from early seedings do not grow out of this cold-hardy stage until after the frost season is past.

Late April and May are about the worst times to plant sericea in the middle and lower South. The plants usually do not have enough roots to carry them through the dry, hot weather that nearly always comes in May and early June.

Late June and early July is a much better time to plant than late spring. The rains that usually come in July and August supply moisture to develop enough roots to take the plants through fall. For summer seeding, however, a heavy rate—at least 40 and preferably 50 pounds per acre—is better than a light rate.

But good second-year growth cannot be expected from summer seeding. Often, particularly on poor soils, sericea from summer seedings does not make enough growth for a cutting of hay the second year.

Seeding on Small Grain

Poor stands usually result in the middle and lower South where sericea is sown on small grain early in the spring. Many of the young seedlings die during late spring or early summer droughts. E. B. Stowers, a supervisor of the Conecuh River Soil Conservation District in southern Alabama, has established satisfactory stands on oats, however, by pasturing the oats off instead of allowing the grain to ripen.

Where grain is to be harvested, it is advisable to disk the stubble after the harvest and then sow sericea, in late June or early July.

Summer seeding after small grain may also be the best way to get a stand of sericea on land stocked with annual lespedeza seed. Preparing the land for sericea destroys annual lespedeza plants, which tend to choke young sericea seedlings. By the following spring, the sericea plants can survive competition from the annual lespedeza plants.

Farmers sometimes plant small grain before seeding sericea on soils that have grown several crops of other legumes. These legumes build up nitrogen in the soil to such an extent that spring-sown sericea is overrun by crabgrass and weeds. The small grain, sown in the fall and harvested the next spring, uses this nitrogen. Sericea plants get enough growth to develop a fairly strong root system by frost and are able to withstand grass and weed competition the following spring and summer.

Seeding at the Last Cultivation of Corn

Several observational seedings of sericea have been made at the last cultivation of corn in Alabama and Georgia. Good stands resulted from some, but in others either the seed did not germinate well or the young plants died. Even where thick stands came up and survived the rest of the summer, growth the following year was rather poor. The uncertainty of getting a thick stand and the loss of plants between corn rows during the summer has kept this method of seeding from being used widely.

Managing Sericea the First Year

Sericea seedlings from very early spring plantings usually develop enough roots to survive the competition of weeds and grass except where the soil is rich enough to produce vigorous growth of weeds. Where weed growth is so heavy that sericea plants become weak and spindly, mowing for weed control is helpful. Mowing is not necessary unless the weeds and grass overtop the sericea plants and completely shade the ground.

A dense stand of crabgrass often beds down on sericea plants, causing completely bare spots. This can be avoided by mowing the green crabgrass for hay. The cutter bar on the mower must be set high enough to clip only the tops from the sericea plants. Otherwise, mowing may weaken the stand.

Should You Use Fertilizer and Lime?

The more successful growers commonly fertilize sericea with about 500 pounds per acre annually of a material such as 0-12-12 or 0-10-10. While the effect of this treatment has not been measured, it is apparent that it helps. The fertilized sericea remains vigorous and has less broomsedge and other undesirable plants than stands that were either not fertilized or fertilized irregularly.

Sericea has shown a more marked response to phosphate than to any other fertilizer. On several fields of very poor soil, phosphate fertilizer made the difference between a sparse growth and a strong, vigorous growth.

Potash does not give as large increase in the growth as phosphate, but on soils where it is required for cotton and tobacco, it helps. Leaves in several fields where potash was not applied or was applied at a low rate have shown the signs of potash deficiency rather strikingly.

Several studies were made with sericea at the Southern Piedmont Conservation Experiment Station to test its response to fertilizer and lime. In general, fertilized sericea made earlier spring growth and larger yields of hay. Sericea fertilized with phosphate and potash made a 7-year average yield of 2.8 tons of hay per acre. The average yield of unfertilized sericea was 1.9 tons per acre.

The effect of fertilizer was also checked by weighing the leaf litter on the ground. Where two to three crops of hay were harvested each year from unfertilized sericea, the amount of litter declined during the 3 years of the study. With the same mowing treatment but with lime, phosphate, and potash added, the amount of litter increased. Where lime, phosphate, and potash were applied and one cutting of hay and one crop of seed



Figure 17.—*Broomsedge came into this sericea stand as the sericea starved out. For 4 years the sericea made large yields of hay. But no fertilizer was applied and broomsedge took over.*

removed, the surface litter increased sharply. With the same lime and fertilizer treatment the range in amount of litter was from 4.25 tons to 14.2 tons per acre. The lowest amount was from sericea mowed three or four times a year and the highest from sericea harvested for seed only.

In Rowan County, Ky., sericea was seeded on an old cornfield where a light application of complete fertilizer had been drilled in the corn rows and, after the corn was up, a small amount dropped by each hill. Four years later, the old corn rows and the individual corn hills could both be traced by the higher and greener sericea plants as a result of the residue from the corn fertilizer.

Fertilizer treatment also has a marked effect on the palatability of sericea. This may account for some of the earlier unfavorable reports on its palatability, since it was often planted on eroded, depleted land without fertilizer. Animals turned in on this sericea reacted much as they do to any other unfertilized pasture on poor land. They did not graze the vegetation from unfertilized land if they could get any other feed that was more palatable.

Sericea usually has not shown outstanding response to liming. Good stands have been found on acid soils, and also on some of the calcareous soils of the Black Belt in Alabama and Mississippi. It seems practical to assume that a ton of ground limestone about once every 5 years will be beneficial in the long run, especially on soils below pH 6.0 in reaction. Small increases in hay yields have been made in a few fields where lime was used along with fertilizer.

Some of the earlier experiences with sericea grown on poor land without fertilizer or lime caused it to be referred to as a poor-land crop. Many of these earlier plantings were harvested only for seed. Thus all the plant

material except the seed was left on the land. Some stands of sericea remained vigorous for many years without any fertilizer.

But where sericea was mowed two or three times a year for hay, the need for fertilizer became apparent. Farmers often got good yields of hay the second and third year after seeding. But they found occasional clumps of broomsedge in the sericea by the fall of the third season. By the end of 4 or 5 years, broomsedge was the predominant plant in many fields (fig. 17). As a result, one of the most common questions that farmers ask about sericea is, "How can I get the broomsedge out of my sericea?" Applying enough fertilizer to keep the sericea strong and vigorous is the best answer to this question.

Pests and Diseases

Weed Pests

Broomsedge is one of the most troublesome pests to farmers. Adequate fertilizing and good mowing management will usually prevent its entry; but it is difficult to eradicate. Broomsedge comes in to fill the openings where sericea starves or is killed by excessive mowing. And it is able to survive even on poor soil. It is much easier to manage sericea from the start and keep a good stand than it is to eradicate broomsedge (fig. 18). In other words, the easiest way to control broomsedge is to keep a vigorous stand of sericea.

Disking and other mechanical measures for broomsedge control have been tried, but such treatment often does as much damage to the sericea plants as it does to the broomsedge. Where unfertilized sericea is mowed excessively, broomsedge often becomes so thick that it is necessary to plow the sericea up and cultivate to a row crop or sow a crop of small grain to eradicate the broomsedge. After the broomsedge is killed by cultivation, the land may be seeded to sericea again. It should be treated with lime where needed and fertilized liberally with phosphate and potash before it is seeded. The problem of managing sericea so as to avoid heavy infestations of broomsedge is more acute on thin, poor soils than it is on the better land.

Dodder is the most serious weed pest of sericea grown for seed. Since most State seed laws prohibit the sale of dodder-infested seed, farmers who wish to sell sericea seed must harvest from fields that are not infested. Farmers who mow or pasture their sericea usually can reduce the amount of dodder until there is not enough to be serious—unless they also want to sell seed.

In the Coastal Plain, a weed often called tall dog fennel is one of the worst pests in sericea fields. This weed (*Eupatorium capillifolium*) is not a fennel, but it is probably known to more people as dog fennel than by any other name. Some call it cypress weed. It grows to a height of 5 feet or more and makes a heavy crop of feathery seed that is easily scattered by wind during the late fall and winter. It usually begins coming into sericea by the second or third year after seeding, and often thickens by the fourth year so that the stand is more weeds than sericea.



Figure 18.—*A good yield of hay being mowed from well-fertilized sericea. There is no broomsedge in this sericea.*

Dog fennel is more prevalent in thin than in thick stands of sericea. This naturally suggests the necessity for seeding enough sericea, early in the spring and on a good seedbed, to insure a thick stand. It further suggests adequate fertilizing to produce vigorous growth of the sericea plants, and good management. Good management includes mowing so as to leave a stubble about 3 inches high and, in the Coastal Plain, making the last mowing by about September 1.

Farmers pasturing sericea report that mowing in August is one of the better control measures for the so-called dog fennel. But they differ as to whether the mowing should be done the first or last part of August. The mowing probably upsets the balance of stored food in the roots. This would weaken the plants, just as mowing sericea late in the fall reduces its vigor.

Sometimes the infestation of dog fennel becomes so heavy that it is necessary to plow the land and grow a cultivated crop before sowing sericea again.

Weeds growing along fences often produce enough seed to cover surrounding land. Any weed-control program that is to be effective must include the destruction of weeds along the fences as well as those in the open fields.

Wild aster and camphorweed are two serious pests in sericea in some localities. The aster has been particularly persistent at the Soil Conservation Service nursery at Chapel Hill, N. C., where sericea is grown on low land that is not sufficiently well drained for sericea roots to develop and penetrate the soil to normal depth. Camphorweed also grows vigorously

on such low land. It is probable that sericea on better drained soils, where normal deep root development would result, would compete with the shallower rooted weeds more effectively than it has done on the flat land at Chapel Hill.

Here, again, good treatment and management of sericea to get and maintain thick, vigorous stands appear to be about the most feasible control measures. Mowing early in the season has not been an effective control at the nursery. The weeds usually have come back ahead of the sericea. Further information is needed about dates of mowing weeds of this kind for most effective control.

In fields where noxious weeds are prevalent, it may be necessary to leave sericea on the land 4 or 5 years and then plow the land for one or more cultivated crops. Yields of corn following sericea (p. 6) indicate that such treatment would be entirely practicable and profitable on land that is suitable for cultivated crops. Measures designed for weed control may lead to a better use of sericea. It may be that it has more value as a crop in a rotation on cropland than as a perennial legume on waste land.

Insect Pests

Sericea has had few insect pests and these have not done any widespread damage. Grass armyworms occasionally defoliate the plants and ruin a cutting of hay. When they occur in late summer or early fall, these worms usually destroy the seed crop.

Minor damage has been done in several localities by stem girdlers. They girdle and cause some stems to die in late summer and early fall, but they do not usually do serious or permanent harm to a stand.

The three-cornered alfalfa hopper attacked sericea in several places in the summer and fall of 1949. Entomologists of the Alabama Agricultural Experiment Station identified the insect in specimen samples from a field in Tuscaloosa County. They reported that the damage was caused by adults and nymphs puncturing stems and sucking the plant juices. These punctures appear singly or in rings that girdle the stem and cause it to die above the girdle. Several chemical sprays and dusts were used in both field and greenhouse trials, but none was fully effective. They recommend that until other control measures are found the affected areas be mowed for hay as soon as damage is observed.

Diseases of Sericea

Sericea has been remarkably free of diseases severe enough to retard growth or thin out stands. No diseases of any real importance have occurred on this plant in the Southeast. Because it seems to be susceptible to cotton root rot, it is not a good plant for use on land where this disease is present. Cotton root rot is confined largely to the Blacklands of Texas; it does not affect sericea in the Southeastern States.

